Plot Description (PD)
Sampling Method

EXECUTIVE SUMMARY

The Plot Description (PD) form is used to describe general characteristics of the FIREMON macroplot to provide ecological context for data analyses. The PD data characterize the topographical setting, geographic reference point, general plant composition and cover, ground cover, fuels, and soils information. This method provides the general ecological data that can be used to stratify or aggregate fire monitoring results. The PD method also has comment fields that allow for documentation of plot conditions and location using photos and notes. The key for the FIREMON database, made up of the Registration Key, Project ID, Plot Number and Date, is part of the PD form.

INTRODUCTION

The Plot Description (PD) methods were designed to describe important ecological characteristics of the FIREMON macroplot. The macroplot is the area where the other FIREMON methods will be applied. All fields in the PD method pertain to the entire macroplot and should be estimated and recorded so that they describe the macroplot as a whole.

There are seven general categories of data in the PD method: 1) required, 2) plot information, 3) biophysical settings, 4) vegetation, 5) ground cover, 6) fire and 7) common/comment. Only the required fields must be completed. However, within each category, there are some groups of fields that belong together and must be completed as a group. These will be evident on the PD Plot Form and discussed in detail in these methods.

All fields in the required category must be completed regardless of the sampling methods employed. These fields uniquely identify the plot data within the FIREMON database.

SAMPLING PROCEDURE

This method assumes that the sampling strategy has already been selected and the macroplot has already been located. If this is not the case, then refer to the FIREMON **Integrated Sampling Strategy** and for further details.

The PD sampling methods described here are the recommended procedures for this method. Later sections will describe how the FIREMON three-tier sampling design can be used to modify the recommended procedure to match resources, funding, and time constraints.

Unlike most other FIREMON sampling procedures, the PD methods are mostly simple, straightforward, and sequential. There are no nested or repeating fields, and most fields require only one piece of data.

If there is data that you would like to collect but cannot due to broken equipment or other unforeseen circumstances record each instance in the Comments field for the plot. For instance, if you cannot measure the slope because the clinometer was broken leave the Slope field empty and note in the Comments field, “No slope measurements were taken because the clinometer was broken”. This will explain empty fields to future users of the data. Do not enter 0 (zero) in a field that could not be assessed. Either leave the field blank or enter the code that denotes you were not able to assess the attribute.

See **How To Locate a FIREMON Plot**, **How To Permanently Establish a FIREMON Plot** and **How to Define the Boundaries of a Macroplot** for more information on setting up your macroplot.

Required PD Fields – Database key

These four fields constitute the key for your FIREMON database. If you are entering data these fields *must* be entered.

The FIREMON Analysis Tools program will allow summarization and comparison of plots only if they have the same Registration and Project Codes. This restriction is set because typically each monitoring project has unique objectives with the sample size and monitoring methods developed for specific reasons intimately related to each project. Comparisons made between projects with dissimilar methods may not be appropriate.

Registration Code – The Registration Code is a 4-character code determined by you or assigned to you. The Registration Code should be used to identify a large group of people such, as all the people at one district of a National Forest or a number of people working under one monitoring leader. You are required to use all four characters. Choose your Registration Code so that the letters and numbers are related to your business or organization. For example:

MFSL = Missoula Fire Sciences Lab
MTSW = Montana DNRC, Southwest Land Office
CHRC = Chippewa National Forest, Revegetation Crew
RMJD = Rocky Mountain Research Station, John Doe

Project Code – The Project Code is an 8-charcter code used to identify project work that is done within the group. You are not required to use all eight characters. Some examples of Project Codes are:

TCRESTOR = Tenderfoot Creek Restoration
BurntFk = Burnt Fork Project
SCF1 = Swan Creek Prescribed Fire, Monitoring Crew 1
BoxCkDem = Box Creek Demonstration Project

It will be easier to read the sorted results if you do not include digits in the left most position of the project code. For instance, if two of your projects are 22Lolo and 9Lolo, then when sorted 22Lolo will come before 9Lolo. The preferred option would be to name the projects Lolo09 and Lolo22, although Lolo9 and Lolo22 will sort in the proper order, also.

Plot Number - Identifier that corresponds to the site where sampling methods are applied. Integer value.

Sampling Date – Enter the date of sampling as an 8-digit number in the MM/DD/YYYY format where MM is the month number, DD is the day of the month and YYYY is the current year. For example, April 01, 2001 would be entered 04/01/2001.

Organization Code Fields

These four fields are provided so that users can sort and summarize data using agency location codes, for instance USFS Region, Forest and District. All for fields allow alphanumeric characters.

Field 1: Organization Code 1 - 4-character field.

Field 2: Organization Code 2 - 2-character field.

Field 3: Organization Code 3 - 2-character field.

Field 4: Organization Code 4 - 2-character field.

Plot Information Fields

Field 5: Examiner Name - The name of the FIREMON crew boss or lead examiner should be entered up to 8-characters. This is a non-standardized field so anything can be entered here, but we suggest the name follow the convention of first letter in first name followed by a dot followed by the entire last name. So, Smokey Bear would be s.bear and John Smith would be j.smith. We strongly suggest that there are no blanks in the text, for example, don't enter Smokey Bear as s. bear.

Field 6: Units – Enter "E" if you will be collecting data using English units or "M" if you using Metric units. These units are used for all measurements in the sampling. The only exception is the Error Units field associated with the GPS location. GPS error may be in English or Metric units regardless of what is entered in Field 6.

The macroplot is the area where you will be applying the FIREMON methods. The size of the macroplot ultimately dictates the representative area to be sampled (table PD-1). If vegetation is dense, large plot sizes usually take longer to sample because it is difficult to traverse the plot. However, some ecosystems have very large trees scattered over large areas so that large plot sizes are needed to obtain realistic estimates. There have been many studies to determine the optimum plot size for different ecosystems with mixed results. We offer the following table to help determine the plot size that matches the fire monitoring application. Plot size and shape selection should be determined by the FIREMON project leader prior to entering the field.

Table PD-1. Suggested FIREMON macroplot plot sizes.

Average plant height (feet)	Plant Cover (%)	Suggested Plot Size (acres)	Plot Radius (feet)	Suggested Plot Size (sq. meters)	Plot Radius (meters)
X < 15	< 50	0.10	37.2	400	11.3
	>50	0.05	26.3	200	8.0
15 < X < 100	< 50	0.10	37.2	400	11.3
	>50	0.08	33.3	300	9.8
X > 100	< 50	0.40	74.5	1,000	17.8
	>50	0.13	42.5	500	12.6

Usually, the 0.1-acre circular plot will be sufficient for most ecosystems and this size should be used if no other information is available. A general rule-of-thumb is that the plot should be big enough to capture at least 20 trees above 4 inch diameter at breast height (DBH) on average (i.e., across all plots in your project). It is important that the plot size stay constant across all plots in a sampling project. For example, if a FIREMON project contains shrublands, grasslands, and forests, don't change the plot size when you sample each one. Select the largest plot size (forests,

in this example) and use it for all ecosystems. In general you should use circular PD macroplot if you are not using any of the vegetation sampling methods.

Two fields in the PD method are used to describe plot shape and size. If the plot shape is circular, then enter plot radius/length in Field 7 and enter 0 (zero) in Field 8. If a rectangular plot shape is required, the length of the macroplot is entered in Field 7 and the width is entered in Field 8. No other plot shapes are used in FIREMON.

Plot size

Field 7: Plot Radius (ft/m) – If the macroplot is circular enter the radius of the macroplot. Enter the length of the macroplot if it is rectangular.

Field 8: Plot Width (ft/m) **–** Enter the width of the plot if it is rectangular, or enter zero (0) or leave the field blank if the macroplot shape is circular.

Sampling information

FIREMON data can be collected on "Monitoring" plots or "Control" plots. Monitoring plots are located inside the treatment area so that you can compare the effects of different treatments on the sampled attributes. Control plots are placed outside the treatment area and used to check that any changes in the sampled attributes were actually due to the treatments and not some unrelated factor. This topic is discussed more in the **Integrated Sampling Strategy** document.

Field 9: Plot Type – Enter "M" if you are sampling a monitoring plot or "C" if you are sampling a control plot.

Field 10: Sampling Event – Monitoring requires that sampling be stratified by space and time. Since monitoring is a temporal sampling of repeated measures, it is essential that you record the reason for sampling to provide a context for analysis. The Sampling Event field is used to document why the plot is being measured at this particular time (as recorded by Date). The Sampling Event field will help you track changes at the plot level more easily than if you used only the sampling date. The codes are used for this field: 1) P is the pre-treatment measurement of the plot, 2) R is the post-treatment, re-measurement of the plot and 3) IV indicates an Inventory plot that is not permanently monumented and won't be resampled (table PD-2). The codes P and R and followed by a numeric value that indicates the sampling visit of the current sampling. For instance, if you sample a plot once before a prescribed fire the code would be P1, then when you sample after the fire the code will be R1 for the first sampling, R2 for the second sampling and so on. When you change event codes, from P to R, you should start the sequential sample number over at 1. The FIREMON database will accept data for up to three pre-treatment measurements. You will have to consult the FIREMON notebook when you are sampling a plot that has been sampled once or more, before, so that you use the appropriate sequential sample number. For simplicity we have only provided standardized codes for pre- and post-treatment measurements. This may be a problem if, for instance, you plan on three measurements: one pre-harvest, one post-harvest/per-burn and one post-burn. We suggest not using the R sampling event code until all the treatments are done. In the previous example the codes would be; P1 for the

pre-harvest sample, P2 for the post-harvest/pre-burn sample and R1 for the post-burn sample. Be sure to note the sampling event numbering scheme in the Metadata table. You can make up your own codes if you chose, however the FIREMON Analysis Tools program will not recognize codes other than those listed in table PD-2 and won't be able to do any analysis for you. If you are doing inventory sampling (e.g. you will not be resampling the plots) code them IV.

Table PD-2. Sampling Event codes.

Code	Event
P*n*	Pre-treatment measurement, sequential sample number.
R*n*	Post-treatment re-measurement of a plot, sequential sample number.
IV	Inventory plot, not a monitoring plot.

Linking Fields

Field 11: Fire ID - Enter a Fire ID of up to 15 characters. The ID number or name that relates the fire that burned this plot to the same fire described in the Fire Behavior (FB) table. This field links this plot scale data with the fire scale data in the FB method. There may be many FIREMON plots referencing one fire. This field will be empty until after the burn has been completed.

Field 12: Metadata ID – Enter code of up to 15-characters that links the plot data to the MD table. The Metadata (MD) table is used to store information on the sampling intensity and methods used in the monitoring project. This field is highly recommended so that important information will be recorded for future reference.

Georeferenced Plot Positions

The next set of fields is important for relocating FIREMON sample plots, and for using FIREMON plot data in mapping and map validation of remote sensing projects. These fields fix the geographic location of the plot center.

Geographic coordinates are nearly always obtained from a Geographic Positioning System (GPS). GPS technology uses data from at least four orbiting satellites to triangulate your position in three dimensions (X, Y, Z or North, East, Elevation) to within 3 to 50 meters of accuracy. GPS receivers are available from many sources and there are a wide range of GPS models to choose from depending on various sampling criteria. GPS selection and training are not part of the FIREMON sampling methods however, there are number of resources that provide advice on purchasing the right GPS for your sampling needs. There are also a wide variety of public and private agencies that provide excellent training. We recommend that the georeferenced coordinates for FIREMON plots be taken from a GPS receiver and not from paper maps such as USGS quadrangle maps because of the high degree of error. Average the plot location over at least 200 readings to reduce the location error.

Many map projections are available to record FIREMON plot georeferenced coordinates. Users can use either latitude-longitude (lat-long) or the UTM (Universal Transverse Mercator) coordinate system. If you are using UTM coordinates record four pieces of data: northing,

easting, zone and datum. Record easting and northing to there nearest whole meter. If you are using lat-long coordinates record latitude and longitude to the sixth decimal place using decimal degrees (this corresponds to about one meter of ground distance at 45 degrees latitude). The down side of lat-long coodinates is that it is difficult to visualize the measurements on the ground (e.g. how far is 0.05 degrees latitude. Be especially alert because units of degrees-min-seconds look very similar to decimal degrees. If using lat-long coordinates enter data in Fields 14, 15, 19, 20 and 21. If using UTM coordinates enter data in Fields 16 to 21

Field 13: Coordinate System – This field is automatically filled based on the data entered in Fields 14 to 21. The user does not see this field.

Field 14: Latitude – Enter the latitude, in decimal degrees to six decimal places.

Field 15: Longitude - Enter the longitude, in decimal degrees to six decimal places.

Field 16: Northing - Enter the UTM northing to the nearest whole meter.

Field 17: Easting - Enter the UTM easting to the nearest whole meter.

Field 18: Zone - Enter the UTM zone of the plot center.

Field 19: Datum - Enter the datum used in conjunction with the UTM coordinates.

Field 20: Position Error - Enter the position error value provided by the GPS unit. This should be entered regardless of whether you are using lat-long or UTM coordinates.

Field 21: Error Units (E/M) **-** Enter the units associated with the GPS error. May be different than the units listed in Field 6.

Fields 5 through 21 make up the information that is critical to have for every FIREMON macroplot, regardless of the sampling intensity or methods you will be using to collect data.

The following sections describe the measurement or estimation of various ecosystem characteristics that are important to fire effects monitoring. These sections are presented in the order of their priority for sampling.

Biophysical Setting Fields

The biophysical setting describes the physical environment of the FIREMON plot relative to the organisms that grow there. Many site characteristics can be included in a description of biophysical setting, but only topography, geology, soils, and landform fields are implemented in FIREMON.

Topography

Field 22: Elevation (ft/m) **–** Enter the elevation above MSL (mean sea level) of the FIREMON plot in feet (meters) to the nearest 100 feet (30 m). Elevation can be estimated from three sources. Most GPS readings include an estimate of elevation and these estimates are usually fairly accurate. Elevation can also be estimated from an altimeter. There are many types of altimeters, but most are barometric, estimating elevation from atmospheric pressure. Altimeters are notoriously fickle and need calibration nearly every day. When there are frequent weather systems passing the area (e.g., cold and warm fronts), altimeters should be calibrated every four hours. Finally, elevation can be taken from USGS topographic maps.

Field 23: Plot Aspect – Enter the aspect of the FIREMON plot in degrees true north to the nearest five degreees. Aspect is the direction the plot is facing. For example, a slope that faces exactly west would have an aspect of 270 degrees true north. Be sure to record the aspect that best represents the macroplot as a whole and not just the point where you are standing. Also, be sure you check your compass reading with your knowledge of the area to be sure that the aspect indicated is really correct. Often, metal on sampling equipment, or iron rebar plot center, can influence the estimation of aspect. For information about using a compass see **How to Use a Compass - Sighting and Setting Declination.**

Field 24: Slope – Record the plot slope using the percent scale to the nearest five percent. The slope is measured as an average of the uphill and downhill slope from plot center. See **How To Measure Slope** for more information. Be sure the recorded slope reflects the slope of the entire plot and not just the line where you are standing. Always enter slope as a positive number.

Field 25: Landform – Enter up to a 4-charcter code that best describes the landform containing the FIREMON macroplot from table PD-3. See **Appendix C: NRIS Landform Codes** for a complete list.

Table PD-3. Landform codes.

Code	Landform
GMF	Glaciated mountains-foothills
UMF	Unglaciated mountains-foothills
BRK	Breaklands-river breaks-badlands
PLA	Plains-rolling planes-plains w/breaks
VAL	Valleys-swales-draws
HIL	Hill-low ridges-benches
X	Did not assess

Field 26: Vertical Slope Shape – Enter up to a 2-character code using the classes in table PD-4, that best describes the general contour of the terrain upslope and downslope from plot center. As you look up and down the slope estimate a shape class that best describes the horizontal contour of the land (figure PD-1).

Field 27: Horizontal Slope Shape – Enter up to a 2-character code using the classes in table PD-4, that best describes the general contour of the terrain upslope and downslope from plot center. This is an estimate of the general shape of the slope parallel to the contour of the slope.

As you look across the slope along the contour, estimate a shape classes that best describes the horizontal contour of the land (figure PD-1).

Table PD-4. Slope shapes.

Code	Slope shape
LI	Linear or planar
CC	Depression or concave
PA	Patterned
CV	Rounded or convex
FL	Flat
BR	Broken
UN	Undulating
OO	Other shape
X	Did not assess

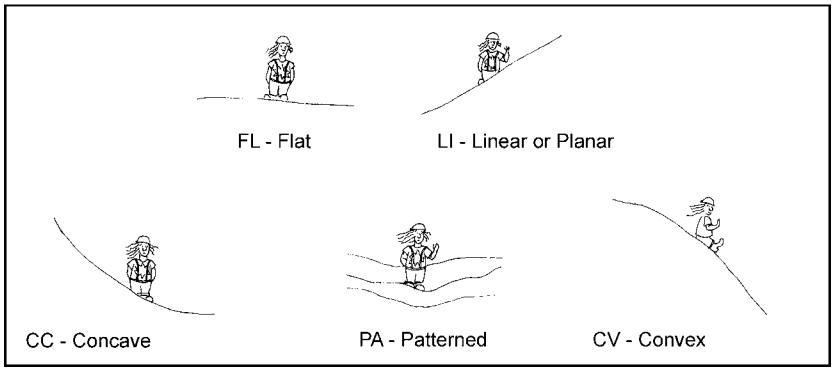

Figure PD-1. These illustrations depict the different types of vertical slope shapes. Horizontal slope shapes use the same classification but are determined by examining the across slope profile, rather than up and down the slope.

Geology and Soils Fields

Field 28: Primary Surfical Geology – This is the first of five fields used to describe geology and soils. Determine the geological rock type composing the parent material at the plot and enter the appropriate code from table PD-5 into the field. Generally, identification of surficial geology requires someone with specialized training and experience.

Table PD-5. Common primary surficial geology codes.

Primary Code	Rock Type 1
IGEX	Igneous Extrusive
IGIN	Igneous Intrusive
META	Metamorphic
SEDI	Sedimentary
UNDI	Undifferentiated
X	Did not assess

Field 29: Secondary Surficial Geology (Field 29-SGEOLOGY) – Use this field only if you have coded a primary surficial geology type. Determine the secondary geological rock type

composing the parent material at the plot and enter the appropriate code from table PD-6 into the field. Generally, identification of surficial geology requires someone with specialized training and experience. Table PD-6 is an abridged list of common surficial types. A complete list is included in **Appendix B: NRIS Lithology Codes.**

Table PD-6. Common secondary surficial geology codes. Additional codes are listed in Appendix B.

Secondary Code	Rock Type 2
ANDE	Andesite
BASA	Basalt
LATI	Latite
RHYO	Rhyolite
SCOR	Scoria
TRAC	Trachyte
DIOR	Diorite
GABB	Gabbro
GRAN	Granite
QUMO	Quartz Monzonite
SYEN	Syenite
GNEI	Gneiss
PHYL	Phyllite
QUAR	Quartzite
SCHI	Schist
SLAT	Slate
ARGI	Argillite
CONG	Conglomerate
DOLO	Dolomite
LIME	Limestone
SANS	Sandstone
SHAL	Shale
SILS	Siltstone
TUFA	Tufa
MIEXME	Mixed Extrusive and Metamorphic
MIEXSE	Mixed Extrusive and Sedimentary
MIIG	Mixed Igneous (extrusive & intrusive)
MIIGME	Mixed Igneous and Metamorphic
MIIGSE	Mixed Igneous and Sedimentary
MIINME	Mixed Intrusive and Metamorphic
MIINSE	Mixed Intrusive and Sedimentary
MIMESE	Mixed Metamorphic and Sedimentary
X	Did not assess

Field 30: Soil Texture Class – The description of soil on the FIREMON plot is limited to a general description because fire effects are not influenced by fine-scale soil characteristics. Generally, identification of soil texture requires someone with specialized training and experience. Many fire effects can be described by general soil characteristics and soil texture is one of those general characteristics. Enter the code that best describes the texture of the soil on

the FIREMON macroplot (table PD-7). These soil textures are described in many soils textbooks. If you are unsure of how to evaluate soil texture or have no confidence in your estimates, then use the X code or leave the field blank. We have only included the codes for soil texture required by FOFEM; if additional codes are desired you may design them on your own and note them in the MD table.

Table PD-7. Soil texture codes.

Code	Description	Code	Description
C	Clay	S	Sand
CL	Clay loam	SC	Sandy clay
COS	Coarse sand	SCL	Sandy clay loam
COSL	Coarse sandy loam	SI	Silt
FS	Fine sand	SIC	Silty clay
FSL	Fine sandy loam	SICL	Silty clay loam
L	Loam	SIL	Silt loam
LCOS	Loamy coarse sand	SL	Sandy loam
LFS	Loamy fine sand	VFS	Very fine sand
LS	Loamy sand	VFSL	Very fine sandy loam
LVFS	Loamy very fine sand	X	Did not assess

Field 31: Erosion Type - Erosion is an important second order fire effect that needs to be documented. We have based the Erosion Type on the classification used by the Natural Resources Conservation Service Soil Survey Handbook (table PD-8). See www.nrcs.usda.gov/technical/references/ for more information. If your macroplot is on a site that has moved in its entirety through landslip include that information in the comments field of the PD form then code Field 31 with the code the identifies the erosion conditions you are seeing on the surface. Be sure to record erosion on pre-burn plots in order to provide the reference conditions. The types of erosion are listed along with the codes in table PD-9. Enter the code that best describes the erosion occurring on the plot.

Table PD-8. Erosion type codes.

Code	Erosion type
S	Stable, no erosion evident
R	Water erosion, rill
H	Water erosion, sheet
G	Water erosion, gully
T	Water erosion, tunnel
W	Wind erosion
O	Other type of erosion
X	Did not assess

Field 32: Erosion Severity - The severity of the erosion event is extremely difficult to assess and is best estimated by those who have some experience with erosion processes. We have based the Erosion Severity on the classification used by the Natural Resources Conservation Service Soil Survey Handbook (table PD-9). The severity codes use the depth and extent of erosion to

quantify severity. Enter the code that best fits the severity of the erosion on the plot in this field. Severity codes do not apply to tunnel erosion. If you have tunnel erosion on your plot enter –1 in this field

Table PD-9. Erosion severity codes

Code	Erosion severity
0	Stable, no erosion is evident.
1	Low erosion severity; small amounts of material are lost from the plot. On average less than 25 percent of the upper 8 in. (20 cm) of soil surface have been lost across the macroplot. Throughout most of the area the thickness of the soil surface layer is within the normal range of variability of the un-eroded soil.
2	Moderate erosion severity; moderate amounts of material are lost from the plot. On average between 25 and 75 percent of the upper 8 in. (20 cm) of soil surface have been lost across the macroplot. Erosion patterns may range from small, un-eroded areas to small areas of severely eroded sites.
3	High erosion severity; Large amounts of material are lost from the plot. On average 75 percent or more of the upper 8 in. (20 cm) of soil surface have been lost across the macroplot. Material from deeper horizons in the soil profile is visible.
4	Very high erosion severity; Very large amounts of material are lost from the plot. All of the upper 8 in. (20 cm) of soil surface have been lost across the macroplot. Erosion has removed material from deeper horizons of the soil profile throughout most of the area.
-1	Unable to assess

Vegetation Fields

These PD fields describe general aspects of the vegetation using percent canopy cover as the measurement unit. All vegetation fields require an estimate of percent canopy cover recorded by class (table PD-10). Canopy cover estimation methods are described in the **How To Estimate Cover**.

Table PD-10. Canopy cover codes. Use these codes to record vegetation cover in the fields the call for cover estimation.

Code	Canopy cover
0	Zero percent canopy cover
0.5	>0-1 percent of canopy cover
3	>1-5 percent canopy cover
10	>5-15 percent canopy cover
20	>15-25 percent canopy cover
30	>25-35 percent canopy cover
40	>35-45 percent canopy cover
50	>45-55 percent canopy cover
60	>55-65 percent canopy cover
70	>65-75 percent canopy cover
80	>75-85 percent canopy cover
90	>85-95 percent canopy cover
98	>95-100 percent canopy cover

Vegetation cover in these PD fields is stratified by lifeform and size class. This makes estimation of canopy cover difficult because all the cover of all plants within a lifeform requires quite a bit of experience to consistently assess lifeform and size class cover when lifeforms and classes are unevenly distributed in all three dimensions. If you are unable to make an estimation for any reason, leave the field blank and note the reason in the comments section (Field 81). Always enter the code 0 (zero) when there is no cover for that ground element.

Vegetation cover does not need to sum to 100 percent by lifeform because there will probably be overlapping cover across all lifeforms. However, the total cover for each lifeform must always be greater than any of the covers estimated for the size classes within that lifeform.

Vegetation - Trees

The following fields provide an estimate of tree cover by size class.

Field 33: Total Tree Cover - Enter the percent canopy cover of all trees using the canopy cover codes presented in table PD-10 above. This estimate includes cover of ALL tree species from the smallest of seedlings to the tallest of old growth stems. It includes all layers of canopy vertically projected to the ground.

Field 34: Seedling Tree Cover - Enter the percent canopy cover of all trees that are less than 4.5 feet (1.4 meters) tall using the codes in table PD-10. This cover estimate includes only the small seedlings.

Field 35: Sapling Tree Cover - Enter the percent canopy cover of all trees that are greater than 4.5 feet (1.4 meters) tall and less than 5.0 in (13 cm) DBH using the codes in table PD-10.

Field 36: Pole Tree Cover - Enter the percent canopy cover of all trees that are greater than 5 in (13 cm) DBH and less than 9 in (23 cm) DBH using FIREMON cover codes in table PD-10.

Field 37: Medium Tree Cover - Enter the percent canopy cover of all trees that are greater than 9 in (23 cm) DBH up to 21 in (53 cm) DBH using the codes in table PD-10.

Field 38: Large Tree Cover - Enter the percent canopy cover of all trees that are greater than 21 in (53 cm) DBH up to 33 in (83 cm) DBH using the FIREMON codes in table PD-10.

Field 39: Very Large Tree Cover - Enter the percent canopy cover of all trees that are greater than 33 in (83 cm) DBH using the codes in table PD-10.

Vegetation - Shrubs

The next set of fields allows the FIREMON sampler to estimate shrub cover in three height size classes.

Field 40: Total Shrub Cover - Enter the percent canopy cover of all shrubs on the plot into using the FIREMON canopy cover in table PD-10. This cover estimate includes vertically projected cover of all shrub species of all heights.

Field 41: Low Shrub Cover - Enter the percent canopy cover of all shrubs that are less than 3 feet (1 meter) tall on the plot using the codes in table PD-10.

Field 42: Medium Shrub Cover - Enter the percent canopy cover of all shrubs that are greater than 3 feet (1 meter) tall and less than 6.5 feet (2 meters) tall on the plot into using the codes in table PD-10.

Field 43: Tall Shrub Cover - Enter the percent canopy cover of all shrubs that are greater than 6.5 feet (2 meters) tall on the plot into using the codes in table PD-10.

Vegetation - Herbaceous

Cover of grasses, forbs, ferns, mosses and lichens are entered in the next set of vegetation fields. If you feel uncomfortable distinguishing between species within and across lifeforms, try to get some additional training from the ecologist, forester, or other resource specialists at your local offices. Phenological adjustments must be made for many herbaceous species because most cure during the dry season, making cover estimation very difficult. Follow the suggestions in **How To Estimate Cover** to get the correct cover estimates.

Field 44: Graminoid Cover - Enter the percent canopy cover of all graminoid species on the plot into using the codes in table PD-10. Graminoid cover includes all grasses, sedges and rushes in all stages of phenology. This cover is for all sizes and species of graminoids.

Field 45: Forb Cover - Enter the percent canopy cover of all forbs on the plot using the FIREMON cover codes in table PD-10.

Field 46: Fern Cover - Enter the percent canopy cover of all ferns on the plot using the FIREMON cover codes in table PD-10.

Field 47: Moss and Lichen Cover - Enter the percent canopy cover of all mosses and lichens on the plot using the codes in table PD-10. These mosses and lichens can be on the ground or suspended from plants in the air (i.e., arboreal).

Vegetation - Composition

The following fields document the dominant plant species in each of three layers or strata on the FIREMON plot. These fields are used to describe the existing vegetation community based on dominance in cover. These descriptions are especially useful in satellite classification for mapping vegetation, developing existing vegetation community classifications, and for stratifying FIREMON fire effects results.

In order for a species to be dominant it has to have at least 10 percent canopy cover in that stratum and the species must have higher cover than any other species in that stratum. In the PD method, two species per stratum are used to describe dominance. The first species (Species 1) is the most dominant in terms of canopy cover, and the second species (Species 2) is the second most dominant. Use the NRCS plant code or local species code to record the species.

There are three strata for stratifying dominant existing vegetation. The first stratum is called the Lower Stratum and is the cover of all plants less than 3 feet (1 m) tall. The Mid Stratum is for plants 3 to 10 feet (1 to 3 m) tall, while the Upper Stratum is for plants taller than 10 feet tall (3 m). Only species cover within the stratum is used to assess dominance. Many shade tolerant tree species can be dominant in all three strata.

If there are no species above 10 percent cover in a stratum, enter the code N indicating that there are no species that qualify for dominance. The same applies if there is no secondary species for dominance.

Field 48: Upper Dominant Species 1 - Enter the species code of the most dominant species in the upper level stratum of the FIREMON plot. This is the stratum that is greater than 10 feet (3 m) above ground level.

Field 49: Upper Dominant Species 2 - Enter the species code of the second most dominant species in the upper level stratum of the FIREMON plot. This is the stratum that is greater than 10 feet (3 m) above ground level.

Field 50: Mid Dominant Species 1 - Enter the species code of the most dominant species in the mid level stratum of the FIREMON plot. This is the stratum that is greater than 3 feet and less than 10 feet (1 to 3 m) above ground level.

Field 51: Mid Dominant Species 2 - Enter the species code of the second most dominant species in the mid level stratum of the FIREMON plot. This is the stratum that is greater than 3 feet and less than 10 feet (1 to 3 m) above ground level.

Field 52: Lower Dominant Species 1 - Enter the species code of the most dominant species in the lowest level stratum of the FIREMON plot. This is the stratum that is less than 3 feet (1 m) above ground level.

Field 53: Lower Dominant Species 2 - Enter the species code of the second most dominant species in the lowest level stratum of the FIREMON plot. This is the stratum that is less than 3 feet (1 m) above ground level.

Potential Vegetation

An important characteristic for describing biotic plant communities, especially in the western United States, is the potential vegetation type. Potential vegetation generally describes the capacity of a site or FIREMON plot to support unique vegetation species or lifeforms. Potential vegetation is evaluated by describing the vegetation that would eventually occupy a site in the absence of disturbance over a long time. For example, an alpine site can only support herbaceous communities because these sites are too cold for shrubs or trees, whereas a clearcut cedar-hemlock site has the potential to support coniferous forest ecosystems. Potential vegetation classifications are highly ecosystem specific and are locally developed for certain regions, so a standardized potential vegetation classification for the entire United States does not currently exist. In FIREMON, potential vegetation is evaluated to broad lifeforms to aid in the interpretation of FIREMON results.

Field 54: Potential Vegetation Type ID - Potential vegetation types are the foundation of many management decisions. Many forest plans and project designs stratify treatments by potential vegetation type to achieve better results. Unfortunately, there is no National standard list of potential vegetation types in the United States. Instead, we have provided a generic field is provided for the user to enter their own PVT code to stratify FIREMON results. This field is not standardized and any combination of alpha or numeric characters can be used. Do not use spaces in the text (e.g., enter ABLA/VASC). Be sure you document your codes in the FIREMON MD table. There are 16 characters available in this field.

Field 55: Potential Lifeform - Enter the potential lifeform code that best describes the community lifeform that would eventually inhabit the FIREMON plot in the absence of disturbance (table PD-11).

Table PD-11. Potential lifeform codes.

Code	Potential lifeform
AQ	Aquatic -- Lake, pond, bog, river
NV	Non-vegetated -- Bare soil, rock, dunes, scree, talus
CF	Coniferous upland forest -- Pine, spruce, hemlock
CW	Coniferous wetland or riparian forest -- Spruce, larch
BF	Broadleaf upland forest -- Oak, beech, birch
BW	Broadleaf wetland or riparian forest – Tupelo, cypress
SA	Shrub dominated alpine – Willow
SU	Shrub dominated upland – Sagebrush, bitterbrush
SW	Shrub dominated wetland or riparian -- Willow
HA	Herbaceous dominated alpine -- Dryas
HU	Herbaceous dominated upland – grasslands, bunchgrass
HW	Herbaceous dominated wetland or riparian -- ferns
ML	Moss or lichen dominated upland or wetland
OT	Other potential vegetation lifeform
X	Did not assess

Ground Cover Fields

This next set of PD fields describes the fuels complex on the FIREMON plot. The first group of fuels fields characterizes ground cover by various characteristics important for evaluating fire effects. The standard FIREMON percent cover class codes (PD-10) are used to quantify ground cover. Ground cover is critical for describing fuel continuity and cover, but it is also used for evaluation of erosion potential and for classification of satellite imagery.

A group of generalized fuel attributes are used to describe biomass characteristics for the entire FIREMON plot. The first fields describe surface fuel characteristics through standardized fuel models, while the last fields describe crown fuel characteristics important for fire modeling.

Ground Cover

Ground cover attempts to describe important attributes of the forest floor or soil surface. Ground cover is estimated into ten different categories, with each category important for calculating subsequent or potential fire effects. Ground cover is another difficult sampling element. Cover within a category is evaluated as the vertically projected cover of that category that occupies the ground. *Only elements that are in direct contact with the ground are considered in the estimation of ground cover*. Ecosystem components suspended above the ground, such as branches, leaves, and moss, are not considered in the estimation of ground cover.

Ground cover is described by a set of 10 fields where the sum *must add to 100 percent* (unlike the PD vegetation cover fields) plus or minus 10 percent. We suggest the following strategy for making these cover estimates. First, estimate ground cover for those categories with the least ground cover. These categories are the easiest to estimate with high accuracies. Be sure you scan the entire FIREMON plot to check for mineral soil, moss/lichen, and rock ground cover. Next, estimate the basal vegetation field to the cover codes 0.5, 3, or 10 (basal vegetation rarely exceeds 15 percent ground cover). Lastly, use the ground cover fields with the most cover (this is

often only one or two fields, such as duff/litter) to make your estimate add to 100 percent. See **How to Estimate Cover** for more information. If you are unable to make an estimation for any reason, leave the field blank and note the reason in the comments section (Field 81). Always enter the code 0 (zero) when there is no cover for that ground element.

Field 56: Bare Soil Ground Cover - Estimate the percent ground cover of bare soil using the codes in table PD-10. Bare soil is considered to be all those mineral soil particles less than 1/16 inch (2 mm) in diameter. Bare soil does not include any organic matter. The bare soil can be charred or blackened by the fire.

Field 57: Gravel Ground Cover - Estimate the percent ground cover of gravel using the codes in table PD-10. Gravel is those mineral soil particles greater than 1/16 inch (2 mm) in diameter to 3 inches in diameter (80 mm). Again, gravel does not include any organic soil colloids. The gravel can be charred or blackened by the fire.

Field 58: Rock Ground Cover - Estimate the percent ground cover of rock using the codes in table PD-10. Rock ground cover is considered to be all those mineral soil particles greater than 3 inches (8 cm) in diameter, including boulders. Rocks can be blackened by the fire.

Field 59: Litter and Duff Ground Cover - Estimate the percent ground cover of all *uncharred* litter and duff on the soil surface using the codes in table PD-10. Litter and duff cover is mostly organic material, such as partially decomposed needles, bark, and leaves, deposited on the ground. Do not include any woody material into this ground cover category unless it is highly decomposed twigs or logs that appear to be part of the duff. Sometimes after a fire the litter and duff will be charred and the cover of this charred litter/duff is estimated into the Charred Ground Cover field and not here. Other ground cover elements that are included in this category include plant fruits, buds, seeds, animal scat and bones. If human litter appears on the FIREMON plot, pick it up and throw it away, and do not include it in the ground cover estimate.

Field 60: Wood Ground Cover - Estimate the percent ground cover of all *uncharred* woody material using the codes in table PD-10. Woody ground cover is only those wood particles that are recognizable as twigs, branches or logs. Do not include cover of suspended woody material, such dead branches connected on shrub or tree stems, into this field.

Field 61: Moss and Lichen Cover - Enter the percent canopy cover of all mosses and lichens on the plot using the codes in table PD-10. These mosses and lichens can be on the ground or suspended from plants in the air (i.e., arboreal). This is the same estimate as in Field 43. The duplication is because some people consider moss an lichens ground cover and some consider it vegetation.

Field 62: Charred Ground Cover - Estimate the percent ground cover of all *charred organic* material using the codes in table PD-10. Char is the blackened charcoal left from incomplete combustion of organic material. Char can occur on any piece of organic matter, such as duff, litter, logs, and twigs, and cover of all char is lumped into this category. Do not include ash into the charred ground cover. If it is difficult to distinguish char and black lichen, try to scrap the

black area with your fingernail and then rub your nail on your plot sheet. Char will usually leave a mark.

Field 63: Ash Ground Cover - Estimate the percent ground cover of all ash material using the codes in table PD-10. Ash can sometimes look like mineral soil, but mineral surface feels sandy or gritty when touched, ash will often feel like a powder. Ash can occur in a variety of colors (red, gray, white), but light gray is often the primary shade.

Field 64: Basal Vegetation Ground Cover - Estimate the percent ground cover of basal vegetation using the codes in table PD-10. Basal vegetation is the area of the cross-section of the stem where it enters the ground surface expressed as a percent of plot cover. This category is extremely difficult to estimate, but fortunately, it has some repeatable characteristics. First, basal vegetation rarely exceeds 15 percent cover, so it will only get four valid FIREMON cover codes: 0, 0.5, 3, or 10. Next, it is highly ecosystem specific. Usually only forested ecosystems have high basal vegetation ground covers. This field is only used for vascular plant species. All non-vascular species are estimated in the Moss/Lichen Ground Cover field.

Field 65: Water Ground Cover - Estimate the percent ground cover of standing water using the codes in table PD-10. Water ground cover includes rainwater puddles, ponding, runoff, snow, ice, and hail. Do not include wet surfaces of other ground cover categories in this estimate. Although water is often only ephemeral, its cover must be recorded to account make cover estimates sum to 100.

General Fuel Characteristics

These fields are designed to describe general, plot-level fuel attributes for mapping and modeling fuel characteristics to predict fire behavior and effects. For instance, these fields could provide the information needed to run the FARSITE model. Estimation of fuel characteristics is highly subjective and very dependent on the experience of the FIREMON crew. If more objective, repeatable, and accurate fuel estimates are needed, then use the Fuel Load (FL) and the Tree Data (TD) methods to more accurately and objectively measure information on surface and crown fuels.

Field 66: Surface Fire Behavior Fuel Model - Choose the appropriate fire behavior fuel model from the Anderson 1983 publication, Aids for Determining Fuel Models for Estimating Fire Behavior, or a custom fire behavior fuel model

Field 67: Fuel Photo Series ID - Many areas in the United States have associated photo series guides. The guides use photos to describe typical fuel loadings by major cover types and geographical area. Each picture is linked to intensively sampled fuel loadings. These series are used to visually estimate fuel loadings by matching the picture with current conditions observed in the field. It is important to note that this method is highly subjective and notoriously inaccurate, but it is often the only means available for quantifying the fuelbed loadings. This PD field is used to record the photo series picture that best describes current fuel conditions. Simply match the picture in the photo series developed for your area with your stand conditions and enter a locally designed code for that picture. You can use the publication number combined with

the picture number to uniquely identify the photo. For instance, if you are using the photo series for estimating natural fuels in the Lake States (Ottmar and Vihnanek 1999) you could combine the NFES publication number, 2579, and the plot number of the photo that best describes your fuels conditions. In this case you would enter NFES2579MP04 in Field 63. You can use up to 12-characters. Design this field to best suit your needs, but document your code conventions in the FIREMON MD table.

Field 68: Stand Height (ft/m) **–** Estimate the height of the highest stratum that contains at least 10 percent crown cover. This value is used to model crown fire spread. Estimate to the nearest 3 feet (1 m).

Field 69: Canopy Fuel Base Height (ft/m) **-** The lowest point above the ground at which there is a sufficient amount of canopy fuel to propagate a fire vertically into the canopy. Canopy fuel base height is a stand level measurement that provides an index for crown fire initiation and should account for dense dead vertical fuels (e.g., lichens, needle-drape, dense dead branches) that could provide a conduit for entrance of a surface fire into the crown. Estimate canopy base height to the nearest foot (0.3 m). A trick to estimating canopy base height for the entire FIREMON plot is to envision a plastic sheet on the ground with a hole for each tree. Then, mentally try to lift the plastic sheet to the first dense section of the crown (i.e., part of crown having burnable biomass that could catch fire). Do this for each tree, and then try to estimate the average height of the sheet.

Field 70: Canopy Cover - Estimate the percent canopy cover of the forest canopy above 6 feet (2 m) using the code in table PD-10. This value is used to estimate crown bulk density for crown fire spread modeling. Be sure the estimate cover as percent vertically projected canopy cover and includes cover for all species.

The Fire Behavior and Effects Fields

These FIREMON fields are used to identify the fire event, describe the fire behavior and the subsequent fire effects. Fire behavior is a physical description of the fire, whereas fire effects are assessed from observations of the ecosystem after the fire has burned the area. Fire behavior data will generally be collected at two scales: the plot scale and the fire scale. Plot scale data is collected on the FIREMON macroplot and is contained in just two fields on the PD field form: flame length and fire spread rate. There is also one field to enter the file name of a fire behavior photo. There will probably never be a fire where samplers are able to collect this data on every macroplot but the information can be useful in determining relationships between fire behavior and fire effects. Recording flame length and spread rate, as well as taking a fire behavior photo, on even a subset of the total plots will be to your advantage. You will be collecting only flame length and spread rate data during a fire event. Any other fields on the PD form that are important to your project will be completed before the fire. Fire scale data, things like fuel moistures, plume behavior and spotting observations are recorded in the FIREMON Fire Behavior (FB) table.

Fire Behavior

Enter the plot scale estimates of flame length and fire spread in the following two fields. This information will be collected during the fire event but using the data sheets from the most recent sampling before the fire. For example, if there were two preburn sampling visits, record data in Fields 71 and 72 on the forms (and then in the FIREMON database) where P2 was coded in the Sampling Event field. We recognize that this may lead to some confusion because you will be doing most of your sampling before the fire, then waiting until the weather allows you to burn at a later date. At that time you will have to relocate the field forms and fill in additional fields – Fire ID, Flame Length, Spread Rate and Fire Behavior Picture. Remember, you can also use the Date field to identify the most recent forms.

Field 71: Flame Length (ft/m) **–** Flame length is the length of the flames from the center of the combustion zone to the end of the continuous flame. It is more highly correlated with fire intensity than flame height. (figure PD-2). Estimate flame length as an average within the FIREMON macroplot boundaries to the nearest 0.5 feet (0.2 meter).

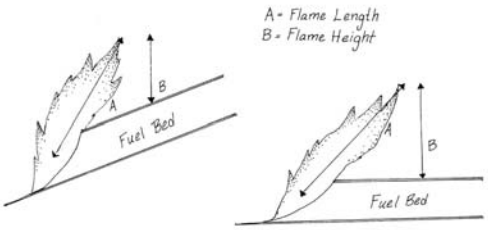

Figure PD-2. Illustration showing flame length vs. flame height measurement. Enter your flame length estimate (A) into Field 71.

Field 72: Spread Rate (ft/min or m/min) **–** Estimate the average speed of the fire as it crosses the macroplot in feet per minute to nearest 1 foot per minute (meters per minute to nearest 0.3 meter). Estimate spread rate by noting the number of minutes it takes for the flaming front to pass two points separated by a known distance.

Field 73: Fire Behavior Picture - Enter the picture code – up to 15 characters - for a picture that best shows fire behavior as the flaming front crosses the FIREMON plot. This code will link to a digital picture placed into the FIREMON database. The picture code can be something like R01P02 for Roll 1, picture number 2 for film cameras, or it could be a filename (e.g., file0001.jpg) for digital cameras. Scan slides or paper photographs into JPEG files for entry into the FIREMON database.

Fire Effects

Fire effects must be evaluated from the burned evidence left on the FIREMON plot after the fire has passed. The fire severity classification used in the PD method is based on the NPS Fire Monitoring Handbook. Fire severity on larger areas (30 X 30 m) can be obtained by completing the Composite Burn Index methods (see the **Landscape Assessment** methods).

Field 74: Fire Severity Code – Enter the number (0 to 5) corresponding to the fire severity observed on the FIREMON plot using the descriptions in table PD-12. This fire severity classification is based on that used in the NPS Fire Monitoring Handbook (www.fire.nps.gov/fmh/books.htm). Examine the substrate and the vegetation on your macroplot, then choose the Severity Code that best matches the conditions you are on the macroplot. Be sure the Fire Severity Code is determined only from observations made inside the macroplot.

Table PD-12. Use these fire severity class to determine the fire severity across the FIREMON macroplot.

FIRE SEVERITY CODE	Substrate	Forest Vegetation	Shrubland Vegetation	Grassland Vegetation
Unburned (5)	Not burned	Not burned	Not burned	Not burned
Scorched (4)	Litter partially blackened; duff nearly unchanged; wood/leaf structures unchanged	Foliage scorched and attached to supporting twigs.	Foliage scorched and attached to supporting twigs.	Foliage scorched
Lightly Burned (3)	Litter charred to partially consumed; upper duff layer may be charred but the duff is not altered over the entire depth; surface appears black; where litter is sparse charring may extend slightly into soil surface but soil is not visibly altered; woody debris partially burned; logs are scorched or blackened but not charred; rotten wood is scorched to partially burned.	Foliage and smaller twigs partially to completely consumed; branched mostly intact.	Foliage and smaller twigs partially to completely consumed; branched mostly intact; typically, less than 60 percent of the shrub canopy is consumed.	Grasses with approximately two inches of stubble; foliage and smaller twigs of associated species partially to completely consumed; some plant parts may still be standing; bases of plants are not deeply burned and are still recognizable.
Moderately Burned (2)	Litter mostly to entirely consumed, leaving coarse, light colored ash (ash soon disappears, leaving mineral soil); duff deeply charred, but not visibly altered; woody debris is mostly consumed; logs are deeply charred, burned out stump holes are evident.	Foliage twigs and small stems consumed; some branches still present.	Foliage twigs and small stems consumed; some branches smaller branches (0.25-0.50 in.) still present; typically, 40 to 80 percent of the shrub canopy is consumed.	Unburned grass stubble usually less than two inches tall, and mostly confined to an outer ring; for other species, foliage completely consumed, plant bases are burned to ground level and obscured in ash immediately after burning.
Heavily burned (1)	Litter and duff completely consumed, leaving fine white ash (ash disappears leaving mineral soil); mineral soil charred and/or visibly altered, often reddish; sound logs are deeply charred, and rotten logs are completely consumed.	All plant part consumed, leaving some or no major stems or trunks; any left are deeply charred.	All plant parts consumed leaving only stubs greater than 0.5 in. in diameter.	No unburned grasses above the root crown; for other species, all plant parts consumed.
Not Applicable (0)	Only inorganic material on site before burn.	None present at time of burn.	None present at time of burn.	None present at time of burn

Common Fields

Photographs, conventional or digital, are a useful means to document the FIREMON plot a number of ways. They provide a unique opportunity to visually assess fire effects and document plot location in a database format. Previously established FIREMON plots can be found by orienting the landmarks in photos to visual cues in the field. Photos can be compared to determine important changes after a fire. Lastly, photos provide excellent communication tools for describing fire effects to the public and forest professionals.

Document the FIREMON macroplot location using two photographs taken facing north and east. For the north-facing photo move about 10 feet south of the FIREMON macroplot center then take the photo facing north being sure that the plot center stake or rebar will be visible in the picture (figure PD-3). Then, move west of the plot center about 10 feet and take a photo facing east, again, being sure that the plot center stake or rebar will be visible in the picture. For these pictures be sure that the camera is focused on the environment surrounding the plot, not the distance or foreground and that the camera is set for the correct exposure and aperture for existing light conditions. A flash might be needed in low-light conditions.

Figure PD-3. Take your plot photos so that they show the plot center and the general plot conditions.

Enter an identifier in Field 75 for the north-facing photo and Field 76 in the east-facing field. Photos taken with conventional film can be identified by assigning a code that integrates the roll number or name (e.g., John Smith Roll 1) and the picture number (i.e., number on camera). For example, John Smith Roll 1 and picture 8 might be assigned JSR01P08 on the PD Plot Form. You must label the roll so that you will be able to find the correct photos after the film has been developed. One way is to take a picture of a card with the roll information on it, as your first photo. Or, you can write the roll information on the film canister before you load it into the camera. The first method is the most foolproof. For digital cameras, enter the file name of the digital picture. Film photos will need to be scanned once they are developed and stored on your computer in digital format. The file names in Fields 75 and 76 will be linked to the plot photos when you enter your data into the FIREMON database.

Field 75: North Digital Photo - Enter a code of up to 15-characters that uniquely describes the location of the photo taken in the direction of due north. This field in the PD database will be linked actual digital photo when you enter data into the FIREMON database.

Field 76: East Digital Photo – Enter code of up to 15-characters that uniquely describes the location of the photo taken in the direction of due east. This field in the PD database will be linked actual digital photo when you enter data into the FIREMON database.

There are many methods for documenting the before and after plot conditions using a series of photos. Rather than describe these procedures in FIREMON, we recommend you use the methods of Hall (2002) for photo point documentation. Hall (2002) has published a guide for establishing and analyzing photo points over time and it is very useful for fire monitoring. You can download Hall's publication at: www.fs.fed.us/pnw/pubs/gtr526/. We have provided fields for two photo points per FIREMON plot. We strongly recommend a comprehensive photo-documentation of the plot conditions. These two additional photo fields will provide you with the opportunity to record important changes on the FIREMON plot.

Enter an identifier in Fields 77 and 78 for the first and second photo points, respectively. The file names in these fields will be linked to the plot photos when you enter your data into the FIREMON database.

Field 77: Photo Point 1 - Enter a code of up to 15-characters that uniquely describes the first photo taken at a point in or near this FIREMON plot. This field in the PD database will be linked actual digital photo when you enter data into the FIREMON database.

Field 78: Photo Point 2 - Enter a code of up to 15-characters that uniquely describes the first photo taken at a point in or near this FIREMON plot. This field in the PD database will be linked actual digital photo when you enter data into the FIREMON database.

Comments Fields

It is impossible for any standardized sampling methodology to estimate all ecosystem characteristics that are important to fire effects monitoring. There may be attributes that are locally important but of limited value in a nationwide fire effects sampling system like FIREMON. A sampling method design that accounts for all ecological variables across the North America would be so large and complex it would be difficult to use and apply. We have tried to reduce complexity in FIREMON, but as a result, we probably missed some variables that describe important ecological conditions for your region. The Comments Fields allows locally important observations to be included into standardized and non-standardized fields.

Local Codes

We included some unstandardized fields so that plot level ecological data that does not fit in any standardized field, can be recorded for later use. For example, you will notice that there is no PD field for structural stage, which is an important vegetation attribute for many land management applications. We omitted structural stage because there are many unstandardized classifications

of structural stage across the country that are only applicable for local conditions and for a limited number of management objectives. However, some FIREMON users may have developed structural stage classes that they want to use and the Local Code and Comments fields allow them a place to store and document that information.

Field 79: Local 1 - Enter a user designed code that is up to 10 characters in length, and uniquely describes some condition on the FIREMON plot. Do not to embed blanks in your codes to avoid confusion and database problems. Document your coding method in the Comments field.

Field 80: Local 2 - Enter a user designed code that is up to 10 characters in length, and uniquely describes some condition on the FIREMON plot. Do not to embed blanks in your codes to avoid confusion and database problems. Document your coding method in the Comments field.

Comments

The Comments field is provided so that the field crew can record any information associated with the macroplot that cannot be recorded elsewhere on the PD form. For example, you can record ecological conditions on the plot, directions for plot location, sampling conditions that might affect data quality and/or other attributes important for management objectives.

It is important that field samplers accurately describe ecological characteristics on the FIREMON plot so that these can be integrated into the monitoring analysis. Important ecological attributes include: wildlife utilization (browsing, grazing), human use (clearcutting, logging, mining), fire characteristics (abnormalities, burn coverage), topographic characteristics (seeps, swales) and/or disturbance (insects, disease, etc).

The notetaker should provide detailed notes for relocating the plot for future remeasurements including succinct, short directions such as “proceed 140 degrees azimuth from junction of roads 432 and 543 exactly 200 meters to a blazed 100 cm spruce”. Try to write the directions as though you will be the one relocating these important plots.

It is important that observations of any factor that might affect the quality and integrity of the collected data be recorded. A sampling condition that is often recorded is the weather – “cold, rainy, windy day”, for instance - but many other factors can be entered, such as, “high stand density which precluded accurate measurement of diameter and canopy cover”.

Comments should directly address the purpose of FIREMON sampling. For example, a sampling objective might be an evaluation of coarse woody debris, so a useful comment might be “many large logs consumed by fire; most were rotten”.

Field 81: Comments– Enter up to a 256-character comment. Try to use shorthand and abbreviations to reduce space as long as the comments are still understandable. You might try to organize comments in a standard order with appropriate punctuation. For example, you might describe weather first and only use colons to separate the next major category of comments.

Precision Standards

Use these standards for the PD method.

Table PD-13. Precision guidelines for TD sampling.

Component	Standard
Latitude	±0.000001 degree
Longitude	±0.000001 degree
Northing	±1 meter
Easting	±1 meter
Elevation	±100 ft/30 m
Aspect	±5 degrees
Slope	±5 percent
All cover estimates	±1 class
Stand Height	±3 ft/1 m
Canopy Fuel Base Height	±1 ft/0.3 m
Flame Length	±0.5 ft/0.2 m
Spread rate	±1 ft/min. or 0.3 m/min.
Severity Class	±1 class

SAMPLING DESIGN CUSTOMIZATION

This section will present several ways that the PD sampling method can be modified to collect more detailed information or streamlined to collect only the most important tree characteristics. First, the suggested or recommended sample design is detailed, then modifications are presented.

Alternative PD Sampling Design

The recommended PD sampling design follows the Alternative FIREMON Sampling Strategy where the optimal number of fields are sampled to achieve a strong, but limited field sample. We suggest that besides the **Required** PD field set, you complete all fields in the **Biophysical Setting** field set, the **Vegetation** field set, and the **Comments** field set. This leaves the Fuels and Fire field sets empty. However, completion of both of these field sets would require less than 5 minutes, per plot, even under the worst conditions. So, it probably would be prudent to complete all PD fields, even if you are working under the Alternative FIREMON Sampling Strategy.

Simple PD Sampling Design

The streamlined PD sampling design follows the Simple FIREMON sampling strategy where only the minimal set of fields are measured. For the PD method, the minimal set of fields are simply those in the **Required** field set. No other fields need be completed. However, completion of the **Comments** and the two plot pictures would add great detail to the simple structure.

Detailed PD Sampling Design

The comprehensive PD sampling design follows the Detailed FIREMON sampling strategy and is quite easy to implement. Simply complete all fields in the PD Plot Form and leave none blank.

User-specific PD Sampling Design

There are three ways to create user-designed fields for describing local ecological conditions. The two local fields in the Comments field set each allow up to a 10-character code in the database. This means the user can design a complex code to describe some important ecological characteristic critical to fire management. For example, the presence of weeds may be a significant management concern, so these fields might describe the cover and species, respectively, of the dominant weed.

Creative approaches can be used to enter local data if more than two fields are needed. Using the weed example, the cover and weed species can be integrated in one field by making the first six characters the local species code and the next two characters the FIREMON cover code. A third attribute, say plant height, could be added as a 2-character code in the 9-10 character slot.

The 256-character comments field also can contain mixes of locally designed fields. Some people create search engines within a database query that look for certain combinations of special characters and numbers to link to a locally created standard field. For example, the term

$SRF could be entered in the comments field to indicate the dominant fire regime (Stand-Replacement Fire).

Sampling Hints and Techniques

Field sampling can become quite complicated, especially when visiting complex ecosystems with many canopy strata and high biodiversity. It can be easy for the field crew to become overwhelmed by all the heterogeneity on the landscape. It is important that the field crew concentrate their evaluation of the PD fields to those ecosystem characteristics inside the FIREMON macroplot.